$GED^{\mathbb{R}} \ EXAM$

GENERAL EDUCATIONAL DEVELOPMENT FORMULA REFERENCE MANUAL

Third Draft Version

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AREA OF A SQUARE $Area = side^2$

A square is a figure with four equal sides and four equal angles. Each angle is a 90 degree angle. A 90^o degree angle is also called a right angle.

4 inches

How to use the area formula to calculate the area of a square with 4 inch sides: Step 1:

Write the formula on your paper.

Area=side² Step 2: Plug in 4 into the formula. Area= 4^2 Step 3 and solution: Do the math.

 $Area = 4^2 = 4 \times 4 = 16 inch^2$

The area of the square with 4 inch sides is therefore 16 square inches

Example 1: One square yard is equal to how many square 1 so feet?

Step 1:

Draw two identical squares side by side. Label the first 1 yard, label the second 3 feet. You know they are identical because 1 yard = 3 feet.



Step 2:

We will apply the area formula on the figure on the left first. Write area formula $Area = side^2$ Step 3: Plug 1 yard into the area formula: $Area = 1^2$ Step 4: Do the math to solve formula $Area = 1^2 = 1 \times 1 = 1$ yard² The Area of the first square is therefore 1 square yard.

Step 5:

Now let's repeat the process for the square on the right. Write formula.

$Area = side^2$ Step 6:

Plug 3 feet into the formula. Area= 3^2 Step 7: Do the math: Area= $3^2=3\times 3=9$ feet²

The area of the second square is therefore 9 square feet.

Step 8

Since you already determined that both squares are identical. Since you determined the first square is 1 square yard and the second square is 9 square feet, you have proven that

1 sq yard = 9 sq feet.

AREA OF A RECTANGLE $Area = length \times width$



A rectangle is a figure with 4 sides. The opposite sides are parallel and the angles are right angles (90 degree). **How to use the formula:**

Step 1:

Write the formula:

Area = *length*×*width*

Step 2:

Plug information from picture into the formula

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Area = 6 \times 3
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Step 3: Do the math

 $Area = 6 \times 3 = 18 \, cm^2$

Notice that there are 18 little squares in the figure that are 1 cm by 1 cm.



A rectangular shaped house 50 ft. by 30 ft. is on a lot that is 90 ft. by 80 ft. How many square feet of land is available to grow a lawn? Solution: Step 1: Find the square footage of the house.

50 X 30 = 1500 sq ft

Step 2: Find the square footage of the complete lot.

 $90 X 80 = 7200 \, sq. \, ft.$

Step 3: To find the area of the lawn, the area of the house must be subtracted from the area

of the whole lawn. 7200 - 1500 = 5700.

Therefore the area of the lawn (green area on the diagram is 5700 square feet or 5700 ft².

Sarah's new computer monitor is 16 inches wide and 10 inches high. What is the viewing area of Sarah's monitor?

Step 1:

Draw a rectangle to represent the viewing area of the monitor. Label the sides.



Step 2: Write Rectangle formula $Area = length \times width$

Step 3: Substitute information into formula.

 $Area = 16 \times 10$

Step 4 and solution: Multiply 16 by 10. $Area = 16 \times 10 = 160 inch^{2}$

AREA OF A PARALLELOGRAM *Area*=*base*×*height*



A parallelogram is a four sided figure with 2 equal sets of opposite sides. The opposite sides are parallel. The angles do not have to be 90 degrees. (A parallelogram with 90 degree angles is called a rectangle.) Note that shape of a parallelogram. The roof of the the red line that shows the height is not part of the figure, but indicates the distance between the top base and the bottom base. How to use the formula:

Area=*base*×*height*

Since the dimensions of the pictured parallelogram are base = 5 cmheight = 3 cmSubstitute data into formula $Area = 5 \times 3$ 5 cm (base) by 3 cm height, $Area = 5 \times 3 = 15 \, cm^2$

Warning: Avoid a common mistake. A student may be tempted to measure the side

of the parallelogram which is about $3\frac{1}{2}$ cm. This measurement is not part of the formula and should not be used.

Example 1:

How many square meters of glass is required to cover the side of the Dockland Building in Altona, Germany. The building is in the building is 30 meters above the dock. The building is 130 meters long. The length of the slanted sides of the building is 75 meters.



Solution:

Step 1:

Since the problem states that the building is a parallelogram, start with writing the parallelogram formula.

Area=*base*×*height*

Step 2: Substitute the given information in the formula.

$Area = 130 \times 30$

Note: The length of the slanted sides (75) meters) is not needed in the formula and should be ignored.

Step 3 and solution:

Find the product(multiply) of 130 and 30.

$Area = 130 \times 30 = 3900 meters^2$

The two large sides of the building according to the formula are each covered by 3,900 square meters of glass.





Triangle 4

How to determine the area of a triangle.:

To apply the formula, you need to know the length of the base and the height. Any side can be used as the base. The height is measured on a line that is perpendicular from the base to the vertex of the opposite angle. See the figures on this page. Although the four triangles shown on this page have different shapes, they all have the same dimensions. They all have a base of 8 cm, and are all 4 cm high. Notice that the height of Triangle 3 is drawn to the left of the base line. This is due to the location of the angle opposite to the base line. Since triangle 4 is a right triangle, the height can be determined by measuring the left side. This is because the left side of the triangle is perpendicular to the base line.

How to use the formula:

Step 1:

Write the area of a triangle problem on your paper.

$$4rea = \frac{1}{2} \times base \times height$$

Step 2:

Rewrite the formula using the dimensions of the triangles on this page.

$Area = \frac{1}{2} \times 8 \times 4$

Notice that although the four illustrated triangles have different shapes, the dimensions of the four triangles are the same. Step 3 and solution:

Do the math:

$$4rea = \frac{1}{2} \times 8 \times 4 = 16 \, cm^2$$

The area of all four triangles is 16 square centimeters.

AREA OF A TRAPEZOID $AREA = \frac{1}{2} \times (base_1 + base_2) \times height$

A trapezoid is a four sided figure with two sides that are parallel. The parallel sides are considered bases when applying the formula.



How to use the Area of Trapezoid formula: Step 1:

Write the formula.

$$AREA = \frac{1}{2} \times (base_1 + base_2) \times height$$

Step 2:

Plug information from figure into formula.

$$AREA = \frac{1}{2} \times (8+4) \times 3$$

Step 3:

Add the two bases:

$$AREA = \frac{1}{2} \times (12) \times 3$$

Step 4 and solution: Do the multiplication:

$$AREA = \frac{1}{2} \times 12 \times 3 = 18 \, cm^2$$

The final answer is 18 square centimeters.

Example:

The height of the front wall of the storage shed is 6 feet. The height of the back of the shed is 4 feet. The shed is 5 feet long(across the front) and 4 feet wide (front to back). John wants to paint the shed. How many square feet of wall will he need to paint.



SOLUTION.

Find the areas of each of the the four sides and add them. Step 1:

Find the area of the rectangular front wall. Write formula for area of a rectangle.

Area=*length*×*width*

Since the front is $\overline{5}$ ft by 6 ft, plug this information into the formula and do the math..

 $Area=5\times 6=30 \, sq \, ft$

Step 2:

Find the area of the rectangular back wall. Write formula for area of a rectangle. Since the back is 5 ft by 4 ft, plug this information into the formula and do the math. Because the the roof slants, the height of the back wall is only 4. $Area = 5 \times 4 = 20 \ sq \ ft$ Step 3:

Find the area of the side walls which are trapezoids. Note that the sides of the shed are identical trapezoids. Think of the trapezoid being on its side.



Note that this photo is the left trapezoid side of the shed on its side. **Note that the roof is on the right.** The height of the Trapezoid is 4 ft, the length of

the shed from back to front. The height is therefore the edge of the trapezoid that is on the ground. The two bases (parallel sides are 6 feet (height of front roof) and four feet (height of back of roof. Therefore the area of the two trapezoids can be solved with the trapezoid formula.

$$AREA = \frac{1}{2} \times (base_1 + base_2) \times height$$
$$AREA = \frac{1}{2} \times (6+4) \times 4 = 20 \ sq \ ft$$

Area of each trapezoid side is therefore 20 sq feet. Step 4:

Add the four sides ;

otal and answer	90 sq ft or 90 ft ²
ight side	20 sq ft
eft side	20 sq ft
ack	20 sq ft
ront	30 sq ft

AREA OF A CIRCLE $AREA = \Pi \times RADIUS^2$

(π is approximately equal to 3.14)

Radius is the distance from the center of a circle to the edge of the circle.



How to find the area of this circle using the area of a circle formula:

Step 1:

Write the formula:

$AREA = \Pi \times RADIUS^2$

Step 2: Substitute information from the picture:

$AREA = \Pi \times 3^2$

Step 3: Change pi to 3.14

$AREA = 3.14 \times 3^2$

Step 4:

Raise 3 to the second power That is 3 X 3 = 9 $AREA = 3.14 \times 9$

Step 5 and solution: Do the math. $AREA = 3.14 \times 9 = 28.26 \ sq \ cm$ How to find the area of a circle given the diameter



Diameter is a line that extends from one edge of the circle to the other. The diameter goes through the center of the circle and divides it into two equal parts.

Step 1:

Write the formula:

$AREA = \Pi \times RADIUS^2$

Step 2:

Find the radius by dividing the diameter by 2. of the radius of the circle. Since we know that the diameter is 4 cm, we divide it by two.

 $4 \div 2 = 2$

Therefore the radius is 2 Step 3: Plug in data into the area formula $AREA = 3.14 \times 2^2$ Step4 and solution: $AREA = 3.14 \times 4$ $AREA = 12.56 \, sq \, cm$ Sometimes it is easier to calculate the area of a circle by letting $\pi = 22/7$ instead of 3.14, especially when the radius is 7 or a multiple of 7.

In the GED test, use 22/7 only if instructed. Example. If the radius of a circle is 7 ft, what is its area?

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Solution. Let \pi = 22/7.

Step 1:

Write formula:

AREA = \Pi \times RADIUS^2
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Step 2:

Substitute given information. Remember in this case

let $\pi = 22/7$. $AREA = \frac{22}{7} \times 7^2$

Step 3:

Raise 7 to the second power $(7 \times 7 = 49)$ To simplify calculation, write as a fraction.

$$4REA = \frac{22}{7} \times \frac{49}{1}$$

Step 4: Cancel the sevens $AREA = \frac{22}{1} \times \frac{7}{1}$

Step 5 and solution: $AREA = 22 \times 7 = 154 \ sq \ ft$

PERIMETER OF A FIGURE

The perimeter of a figure is the total length of the outside edges of a figure. The pentagon on the right has five 1 cm sides. Since each side is 1 cm, the total length of the five sides or the perimeter is 5 cm.

The GED test provides formulas for three types of figures. A GED test taker can either add the sides of any figure or apply the given formulas. If solved correctly the results will be the same.

PERIMETER OF A SQUARE *Perimeter* = $4 \times side$

How to solve perimeter of a square problem using formula:

Step 1:

2 cm

Write formula.

 $Perimeter = 4 \times side$

Step 2:

Substitute actual length of side into the formula. In this case the length of the side is 2 cm.

 $Perimeter = 4 \times 2$

Step 3 and solution: Do the math. Perimeter = 8 cmNote that this is the same as adding all 4 of the sides. 2 cm + 2 cm + 2 cm + 2 cm = 8 cm. PERIMETER OF A RECTANGLE $Perimeter = 2 \times length + 2 \times width$ How to solve perimeter of a rectangle problem. 2 cm 4 cm Step 1: Write formula. $Perimeter = 2 \times length + 2 \times width$ Step 2: Substitute information into the formula length = 4cmwidth = 2 cm $Perimeter = 2 \times 4 + 2 \times 2$ Step 3 and solution:

Do the math. Remember the order of operations. Do the multiplication before the addition.

Perimeter = 8 + 4Perimeter = 12 cm

PERIMETER OF A TRIANGLE $Perimeter = side_1 + side_2 + side_3$

How to solve perimeter of a triangle formula.



Step 1: Write formula. $Perimeter = side_1 + side_2 + side_3$ Step 2: Look at the illustration and determine information needed to solve the formula side 1 = 4 cm side 2 = 5 cm side 3 = 3 cm Step 3: Plug information into the formula Perimeter = 4 + 5 + 3Step 4 and solution: Do the math. Perimeter = 4 + 5 + 3 = 12 cm



other. The diameter goes though the center of the circle and divides it into two equal parts.

How to solve:

Find the circumference of this circle. Step 1:

Write the circumference formula.

Circumference = $\Pi \times diameter$ Step 2:

Since the circumference is 4 cm, replace the word circumference with 4.

Circumference = $\Pi \times 4$

Step 3:

Replace π with 3.14 into the formula. *Circumference*=3.14×4 Step 4: Do the math. *Circumference* = $3.14 \times 4 = 12.56$ cm The solution is therefore 12.56 cm

How do you find the circumference of a circle given the radius.



How to solve: Step 1: Write the Circumference formula. Circumference = $\Pi \times diameter$ Step 2:

The formula requires the diameter. Since the diameter is not given, you must calculate the diameter by multiplying radius times 2. $Diameter = radius \times 2$ $Diameter = 3 \times 2$ Diameter = 6Step 3: Substitute diameter into Circumference formula. $Circumference = \Pi \times diameter$ $Circumference = \Pi \times 6$ Step 4: Replace π with 3.14 into the formula. $Circumference = 3.14 \times 6$

Step 5 and solution: Do the math. Circumference = $3.14 \times 6 = 18.84$ cm

VOLUME OF A CUBE

$Volume = edge^{3}$

A cube is a solid figure with all equal edges. A child's block is an example of a cube. The figure on the right is 2 cm long, 2 cm wide, and 2 cm high. It is therefore the drawing of a cube. We can also say that each edge of the figure is 2 cm.

How to find the volume: Step 1: Write the formula. $Volume = edge^{3}$

Step 2: Substitute data from picture $Volume = 2^3$ Step 3: Do math. $Volume = 2^3 = 2 \times 2 \times 2 = 8 \text{ cm}^3$

The volume is therefore 8 cubic centimeters

Example:

One cubic yard is the same as how many cubic feet? Solution:



First note 1 yard = 3 feet Therefore both figures above are identical. We will apply the volume of a cube formula for each figure separately. Solve figure on the left first. Step 1: Write formula $Volume = edge^{3}$ Step 2: Substitute data from picture into formula: Each edge = 1 yard. $Volume = 1^3$ Step 3: Since 1^3 is the same as $1 \times 1 \times 1$. Rewrite the formula as $Volume = 1 \times 1 \times 1$

Step 4: Do the math. 1 times 1 times 1 = 1 Volume = 1

The volume of the first cube is therefore 1 cubic yard.

Now let's repeat the process for the cube on the right.

Step 1: Write formula $Volume = edge^{3}$ Step 2: Substitute data from picture into formula: Each edge = 3 feet. $Volume = 3^{3}$ Step 3: Since 3^{3} is the same as 3 X 3 X 3. Rewrite the formula as $Volume = 3 \times 3 \times 3$ Step 4 and solution: Do the math. 3 times 3 times 3 = 27 3 X 3 = 9; 9 X 3 = 27 Volume = 27The volume of the second cube is therefore

The volume of the second cube is therefore 27 cubic feet. Since both cubes are the same, we know that 1 cu yard = 27 cu feet.

VOLUME OF A RECTANGULAR SOLID $Volume = length \times width \times height$

A rectangular solid is a solid 6 sided figure. The figure below has a length of 4 cm, a width of 2 cm and a height of 3 cm.

How to find the volume:

Step 1: Write formula: Volume=length×width×height



Step 2: Plug in data: $Volume = 4 \times 3 \times 2$ Step 3: Do math: $Volume = 4 \times 3 \times 2 = 24 \text{ cm}^3$

The volume of the figure is therefore 24 cubic centimeters

Example:

Joe needs to fill his kitchen sink half-way with water to wash his dishes. His sink is 20 inches long, 16 inches wide and 8 inches high. How many cubic inches of water will he use.



Step 1: Write down the formula for a rectangular solid. $Volume = length \times width \times height$ Step 2: Find the information you will need from the problem. Length = 20 inches Width = 16 inches Height equals $8 \div 2 = 4$ (remember Joe is going to fill the sink half way up.

Step 3:

Substitute information into the formula. *Volume* = $20 \times 16 \times 4$

Step 4 and solution:

Solve the formula by multiplying 20 times 16 times 4. $Volume = 20 \times 16 \times 4 = 1280$ inches³

The answer is therefore 1280 cubic inches or or 1280 in³

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VOLUME OF A SQUARE PYRAMID

Volume = \frac{1}{3} \times (base \ edge)^2 \times height
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A square pyramid is a solid figure. The square pyramid on the left has a base edge length of 2 cm, a height of 4 cm. Note that a square pyramid has all equal base edges.

How to find the volume:

Step 1:

Write square pyramid formula:

 $Volume = \frac{1}{3} \times (base \, edge)^2 \times height$

Step 2:

Substitute 2 for the base edge and 4 for the height.

 $Volume = \frac{1}{3} \times 2^2 \times 4$

Step 3 and solution: Do the math.

$$Volume = \frac{1}{3} \times 2^2 \times 4 = 5 \frac{1}{3} cm^3$$



The Great Pyramid of Giza was built in Egypt over 4000 years ago. The height is approximately 150 meters and the length of each of the sides of the square base is approximately 230 meters.

What is the approximate volume of this structure?

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Step 1:
Write the formula on a piece of paper.
Volume = \frac{1}{3} \times (base edge)^2 \times height
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Step 2:

Substitute the dimensions of the figure into the formula.

 $Volume = \frac{1}{3} \times 230^2 \times 150$

Step 3:

Take the square of 230 by multiplying $230 \times 230 = 52900$

$$Volume = \frac{1}{3} \times 52900 \times 150$$

Step 4: Multiply 52900 X150 = 7935000 $Volume = \frac{1}{3} \times 7935000$

Step 5 and solution:

The easiest way of multiplying a number times 1/3 is dividing by 3. *Volume* = 2645000 *cubic feet*

VOLUME OF A CYLINDER

 $Volume = \Pi \times RADIUS^2 \times HEIGHT;$

(Let π = 3.14 if not told otherwise)



A cylinder is a solid figure. The cylinder above has a diameter of 4 cm and a height of $3\frac{1}{2}$ cm.

Find the volume of this cylinder using the volume-of-a-cylinder formula.

To simplify the math use

$$\Pi = \frac{22}{7}$$

Solution: Step 1: Write the formula: $Volume = \Pi \times RADIUS^2 \times HEIGHT$

Step 2:

Find the radius. You are given the diameter. Find the radius using this formula:

 $radius = \frac{diameter}{2}$ $radius = \frac{4}{2} = 2$ The radius is therefore 2 cm.

Step 3:

Substitute given information into the formula Change 3 $\frac{1}{2}$ to 7/2 to simplify math.

Use
$$\Pi = \frac{22}{7}$$

 $Volume = \frac{22}{7} \times 2^2 \times \frac{7}{2}$

Step 4: square the radius $2^2 = 4$ *Volume* $= \frac{22}{7} \times 4 \times \frac{7}{2}$ Step 5: To simplify math write 4 as 4/1 $Volume = \frac{22}{7} \times \frac{4}{1} \times \frac{7}{2}$

Step 6: Divide the 22 and the 2 by 2 $Volume = \frac{11}{7} \times \frac{4}{1} \times \frac{7}{1}$

Step 7: Divide the two sevens by seven.

 $Volume = \frac{11}{1} \times \frac{4}{1} \times \frac{1}{1}$

Step 8: Multiply the numerators and denominators. $Volume = \frac{44}{1}$ Step 9 and solution: Divide 44 by 1 to find area $Volume = \frac{44}{1} = 44 \text{ cm}^2$ The area is 44 square centimeters

VOLUME OF A CONE $Volume = \frac{1}{3} \times \pi \times radius^2 \times height$ Let $\pi = 3.14$



How to use the formula: The figure above shows a cone with a radius of 3 cm and a height of 6 CM.

Step 1: Write the formula $Volume = \frac{1}{3} \times \pi \times radius^2 \times height$ Step 2: Substitute the information from the figure into the formula:

$$Volume = \frac{1}{3} \times 3.14 \times 3^{2} \times 6$$

Step 3: Solve the formula.
$$3^{2} = 9 \quad Volume = \frac{1}{3} \times 3.14 \times 9 \times 6$$

3

$$Volume = \frac{1}{3} \times 3.14 \times 9 \times 6 = 56.52 \ cm^3$$



Example:

The diameter of the frozen ice cream cone on the left is 6 cm. It is 11 cm high. The cone is sold with the cone completely filled with ice cream. How many cubic centimeters of ice cream comes with the cone?

Step 1: Since the solution of the volume of a cone requires the radius, Find the radius of the cone.

Remember: $radius = \frac{diameter}{2}$. plug in the numbers: $radius = \frac{6}{2} = 3 cm$.

Step 2: Write the cone formula

 $Volume = \frac{1}{3} \times \pi \times radius^2 \times height$

Step3: Substitute dimensions of the ice cream cone into the formula.

$$Volume = \frac{1}{3} \times 3.14 \times 3 \times 11$$

Step 4 and solution:

Using the Casio fx 260 solar calculator, the answer is $Volume = \frac{1}{3} \times 3.14 \times 3 \times 11 = 34.54 \text{ cm}^3$

DISTANCE BETWEEN TWO POINTS

 $\sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$

To find the distance between two points, the student must apply the distance formula.

Before attempting the solution, the student must understand:

- Order of operations
- How to compute the square of a number(exponent)
- Find the square root of a number
- Subtract signed numbers

How to understand the conventions of referring to a point

on a grid. Note the grid on the right. There are two main axis that cross at the origin which is (0,0) The X axis Horizontal (←→) The Y axis Vertical (↑↓)

Solve the following problem using the distance formula:

What is the distance between the following two points on a coordinate plane or grid? Point 1: (8, -8)

point 2: (-4, 8)

On the figure on the right, the solid red line represents the distance between the two points.

Note: If point 1 is interchanged with point 2, the results will be the same.

To find point 1: from the origin(0,0) count eight spaces to the right(X axis) and eight lines down. Right axis. Where the two lines cross is the (8, -8) point

to find point 2 on the grid, start from the origin, count four spaces to the left and eight lines up. Where the two lines meet



Solution:

Step 1: Write the formula for finding the distance between two points on a coordinate plane.

Distance =
$$\sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$$

Step 2:

Substitute numbers from the problem to replace letters from the formula.

Jse this chart as guide				
	X coordinate	Y coordinate		
Point 2	-4	8		
Point 1	8	-8		

remember first number is a paired coordinate is x and the second is y. The subscript below the number refers to the point

$$Distance = \sqrt{(-4-8)^2 + (8-(-8))^2}$$

Step 3: Do calculations within parenthesis. If you forgot how to subtract signed numbers, count the number of spaces between the x coordinate lines and the number of spaces between the y coordinate lines. In this example there are 12 spaces between -4 and 8 (x coordinates) and 16 spaces between 8 and -8 (y coordinate) It makes no difference if the results are negative or positive.

$$Distance = \sqrt{(-12)^2 + (16)^2}$$

Step 4: Do the exponents. $Distance = \sqrt{(144) + (256)}$

Step 5: Do the addition $Distance = \sqrt{400}$

Step 6 and result: Find the square root Distance = $\sqrt{400}$ = 20 units

The line is therefore 20 units long

SLOPE OF A LINE $Slope = \frac{Y_2 - Y_1}{X_2 - X_1}$

To find the slope of a line given two points on the line, the student may apply the slope-of-a-line formula. Before attempting the solution, the student must understand how to subtract signed numbers

How to understand the conventions of referring to a point

on a grid. Note the grid on the right. There are two main axis that cross at the origin which is (0,0)The X axis Horizontal ($\Leftarrow \rightarrow$)

The Y axis Vertical ($\mathbf{\uparrow \downarrow}$)

Solve the following problem using the slope of a line formula:

Example:

What is the slop of the solid red line on the right. The line goes through the following two points.

Point 1: (8, -8)

point 2: (-4, 8)

Note: If point 1 is interchanged with point 2, the results will be the same.

To find point 1: from the origin(0,0) count eight lines to the right(X axis) and eight lines down. Right axis. Where the two lines cross is the (8, -8) point

to find point 2 on the grid, start from the origin, count four lines to the left and eight lines up. Where the two lines meet is point 2: (-4, 8).



Step 1: Write the formula for finding the slope of a line.

$$Slope = \frac{Y_2 - Y_1}{X_2 - X_1}$$

Step 2:

Substitute numbers from the problem to replace letters from the formula.

	X coordinate	Y coordinate
Point 2	-4	8
Point 1	8	-8

remember first number is a paired coordinate is x and the second is y. The subscript below the number refers to the point

$$Slope = \frac{8 - (-8)}{-4 - 8}$$

Step 3: Do calculations. If you forgot how to subtract signed numbers, count the number of spaces between the x coordinate lines and the number of spaces between the y coordinate lines. (In grid on left see the dashed red lines. In this example there are 12 spaces between -4 and 8 (x coordinates) and 16 spaces between 8 and -8 (y coordinate).

 $Slope = \frac{16}{-12}$

Step 4: You could use division to solve, but it is easier to reduce the above improper fraction to

$$Slope = \frac{4}{-3}$$

Step 5: The answer could be left as an improper fraction, but it is best to change to a mixed number

 $Slope = -1\frac{1}{3}$

Pythagorean Relationship

Must understand powers and roots to solve Pythagorean Relationship formula.

 $a^2 + b^2 = c^2$

Works with triangles with a right angle.

In the right triangle pictured below, the sides (a and b) adjacent to the right angle in the picture below are called legs. The side opposite to the right angle (side c) is called the hypotenuse.



To find the length of the hypotenuse, you must square the lengths of the legs; add the squares and then take the square root of the answer.

To make this clear we will assign lengths to each of the sides of the triangle. See below.



Demonstration:

Step 1:

Write the formula: $a^2 + b^2 = c^2$

Step 2:

Substitute actual lengths in the Pythagorean relation formula. Don't for get that each length must have an exponent.

$$3^2 + 4^2 = 5^2$$

Step 3:

The next step is to square each term of the equation. That is: $3 \times 3 = 9$, $4 \times 4 = 16$, and $5 \times 5 = 25$

$$9 + 16 = 25$$

After adding the 9 + 16 on the left side of the equation, you can see that 25 = 25 and for our purposes we have shown that the Pythagorean relationship is valid

25=25



Example: Ivan wants to find out how high his roof is from the ground. He takes a ladder that is 143 inches high and leans it against his house. He places the bottom of the ladder 55 inches from the house. Notice that the ladder against the house forms a right triangle. The three sides are:

- The ladder- 143 inches
- The distance from the bottom of the house to the bottom of the ladder 55 inches
- The height of the wall. unknown

We will apply the Pythagorean relationship to determine the height of the wall.

Step 1:

Write the formula.

 $a^2+b^2=c^2$

Step 2:

Look at the information in the problem and substitute all know information.

a = 55 (distance on the ground.

b is unknown. The height of the side of the building c is the hypotenuse. Length of the ladder

 $55^2 + b^2 = 143^2$

Step 3:

Find the square of 55 and the square of 143.

 $3025 + b^2 = 20449$

Step 4:

Subtract 3025 from both sides of the equation

$$(3025 - 3025) + b^2 = (20449 - 3025)$$

 $b^2 = 17424$

Step 5 and solution:

Take the square root of both sides of the equation

$$\overline{b^2} = \sqrt{17424}$$

b = 132 inches

Mean also referred to as Average

$$mean = \frac{x_1 + x_2 + \dots + x_n}{n}$$

This formula tells us that we add a bunch of numbers (at least two)

We then take the total or sum and divide it by the numbers we added.

X₁ in the formula refers to the first number that we are going to add. X₂ refers to the second number. +...+ tells us that we can add as many numbers as there are. X_n refers to the last number. n refers to the number of numbers we are adding. The N below the bars tells us that we will divide the total by the number of numbers we have. $n = \frac{8+4+6+14+12+1}{8}$ Remember N represents the number of Step 3: Do the math. 76

We know from our knowledge of algebra that the bar means divide.

Example 2: Mike received the following scores on his GED test. What Example 1 was his mean score Lets find the mean of the following six numbers. 460 Mathematics 4 6 14 12 10 20 2 Language Arts, Reading 500 Language Arts, Writing 410 Note that the mean is never lower than the lowest number or Science 470 higher than the highest number. Social Studies 510 Step 1: Write the equation: **Step 1:** Write the equation: $mean = \frac{x_1 + x_2 + \dots + x_n}{n}$ $mean = \frac{x_1 + x_2 + \dots + x_n}{n}$ Step 2: **Step 2:** Substitute the terms in the question: $mean = \frac{8 + 4 + 6 + 14 + 12 + 10 + 20 + 2}{8}$ $mean = \frac{460 + 500 + 410 + 470 + 510}{5}$ Remember N represents the number of terms in the example. **Step 3:** Find the total of all the terms: Step 3: Do the math. $mean = \frac{2350}{100}$ $mean = \frac{76}{8}$ Step 4 and solution: Divide the total 2350 by the number of Step 4 and solution: Divide the total 76 by the number of terms, in this case the number of terms is 5. terms, in this case the number of terms is 8. $mean = 76 \div 8 = 9.5$ $mean = 2350 \div 5 = 470$

Median

The median is the middle number in a set of numbers.

Although the median is on the GED formulas page. It is not a formula.

The GED formula page defines median as follows. "Median = the middle value of an odd number of ordered scores, and halfway between the two middle values of an even number of ordered scores."

Do not worry about the word score in the definition. Median can refer to any type of data. For example a group of five men weigh the following.

John	175 lb.
Harry	165 lb.
Juan	195 lb.
Peter	275 lb.
Sean	210 lb.

Step 1:

To find the median weight of the five men, write the weights in ascending order

		2000
John	165 lb.	
Harry	175 lb.	Step 1
Juan	195 lb.	Wem
Peter	210 lb.	
Sean	275 lb.	

Step 2:							
Determine which value is in the middle of the list.		Wednesday	\$50.00				
		Monday	\$75.00				
		Friday	\$100.00				
John	165 lb.	Tuesday	\$175.00				
Harry	175 lb.	Saturday	\$250.00				
Juan	195 lb.	Thursday	\$275.00				
Peter	210 lb.						
Sean	275 lb.	Step 2: We must find the middle number					
	It is obvious in this case that 195lbs. Is the median. Half the		Step 2. we must find the middle number.				
It is obvious in this cas							
		Wednesday	\$50.00				
Lets try another demon	stration. The following shows Mike's	Monday	\$75.00				
commissions from selling Vacuum cleaners last week. What is his median commission for the week.		Friday	\$100.00				
		Tuesday	\$175.00				
Monday	\$75.00	Saturday	\$250.00				
Tuesday	\$175.00	Thursday	\$275.00				
Wednesday	\$50.00	OOPS: we have two middle numbers. What do we do? Step three: Find the number half way between the middle numbers. V					
Thursday	\$275.00						
Friday	\$100.00						
Saturday	\$250.00						
Step 1: We must put the data into ascending order.		following expression $\frac{100+175}{2}$ This is easy. Add 100 + 175 = 275 Then divide 275 ÷ 2 = 137.5 Therefore the median commission for the six days is \$137.50					

Simple Interest Formula

interest = *principal*×*rate*×*time*

Interest is the fee you pay to borrow money. It is similar to paying rent to live in an apartment.

Principal is the amount of money you borrow.

Rate is the percent of the principal you must pay to borrow money. When plugged into the formula, we sometimes recommend that rate be written in the form of a fraction or ratio, thus 8% should be written 8/100. 3.5% should be written as 3.5 over a hundred. However if you are using the calculator, 8% can be written as .08 and 3.5% can be written as 035

Time refers to the amount of years you borrow money.

For example if you borrow money for one year, time = 1, if you borrow money for ten years, time = 10. Since there are 12 months in a year, a month is 1/12 of a year. So, if you borrow money for 6 months, time = 6/12. If you borrow money for 18 months, time = 18/12.

Demonstration (fraction method):

Bob bought \$1200 a savings bond that matures in eighteen months. It yields 3% interest. What will the value of the bond be in eighteen months at maturity.

Step 1: Write the simple interest formula formula. *interest* = *principal*×*rate*×*time*

Step 2:

Plug in the amounts of the data into the formula. In this case or when the numbers used in the problem are not easily changing the data into fractions will enable you to solve the problem without using a calculator. You will enter the principal as 1200/1

The rate 3% in the form of a ratio or fraction as 3/100.

$$interest = \frac{1200}{1} \times \frac{3}{100} \times \frac{18}{12}$$

The time as 18/12. (remember that a month is 1/12 of a year) Step 3: You can divide both 1200 and 100 by 100. This will cancel out the zeros

$$interest = \frac{12}{1} \times \frac{3}{1} \times \frac{18}{12}$$

Step 4:
Step 5:
$$interest = \frac{1}{1} \times \frac{3}{1} \times \frac{18}{1}$$

Cancel out the two 12s.
Step 6:
$$interest = 3 \times 18 = \$54$$

Do the math.

Step 7 and solution:

To find the final value of the Savings bond. Add the original value \$1200 to \$54 interest.

final value = 1200 + 54 = \$1254

Demonstration (decimal method)

You can use this method when you prefer using a calculator divided with each other.

We will use the problem described in the previous demonstration.

Bob bought \$1200 a savings bond that matures in eighteen months. It yields 3% interest. What will the value of the bond be in eighteen months at maturity.

Step 1: Write the simple interest formula formula. *interest* = *principal*×*rate*×*time*

Step 2:

Plug in the amounts of the data into the formula. In this case we will use the decimal form for all the data. You will enter the principal as 1200 The rate 3% in the form of a decimal is .03 If the time were in years you would merely plug in the number of years. In his case the time is given in months. To change this to decimal form divide the number of months by 12. Therefore $18 \div 12 = 1.5$

interest = $1200 \times .03 \times 1.5$

Step 3: Do the multiplication: *interest* = $1200 \times .03 \times 1.5 = 54$

Step 4: Add the amount of interest received to the original value of the bond.

final value = 1200 + 54 = \$1254

Distance Formula *distance*=*rate*×*time* distance refers to the number of miles or kilometers traveled Rate can be referred to in two ways in the US administered GED test: The number of miles traveled in one hour. This is called miles per hour (mph) The number of kilometers traveled in one hour. This is called kilometers per hour (kph) In Canada only kph is used. For example if John travels 60mph on the interstate. In one hour John will travel 60 miles. *distance*=rate×time $distance = 60 \, mph \times 1 \, hr$ distance = 60 milesIf Sam drives 60 mph on the interstate for two hours, How many miles will he travel? $distance = rate \times time$ $distance = 60 \, mph \times 2 \, hrs$

distance = 120 milesFor example if Jean travels 100 kph for three hours, he will travel 300 km.

distance=*rate*×*time*

 $distance = 100 \, kph \times 3 \, hrs$

distance=300 kilometers

The distance formula can be modified to find the rate. Example:

Find the rate given the distance and the time

 $rate = \frac{distance}{time}$

John ran on a treadmill for 2.5 hours. He set his heart pulse rate goal to 130. The display reported that he ran 8.3 miles. What was his rate in miles per hour (mph)?

Step 1: Write the formula on your paper. $rate = \frac{distance}{time}$

Step 2: Determine what information is needed to solve the
problem. In this case you need
distance = 8.3 miles
time = 2.5 hours.Substitute
the pulse rate. Ignore it.Notice that you do not need to know the pulse rate. Ignore it.*ti*Step 3 and solution:
Substitute the needed information into the formula.Substitute the needed information into the formula.

$$rate = \frac{8.3}{2.5} = 3.32 \, mph$$

remember that the bar indicates division. This is another way of writing the example: $rate = 8.3 \div 2.5 = 3.32 \text{ mph}$ The distance formula can also be modified to find the time:

$$time = \frac{distance}{rate}$$

Candace travels 160 miles to work and back each day. She averages 60 mph on the interstate. How long does it she have to travel each day.

Step 1:

Write the formula.

$$ime = \frac{distance}{rate}$$

Step 2:

Substitute the given information (distance and rate) into the formula.

$$time = \frac{160}{60}$$

Step 3:

Solve the formula by dividing 160 miles by 60 mph.

 $time = \frac{160}{60} = 2\frac{2}{3}hours$

The answer is $2\frac{2}{3}$ hours. Or 2 hours and 40 minutes.

Total Cost Formula

 $total cost = (number of units) \times (price per unit)$

Total cost is the total amount of the bill. The number of units refers to the number of things you are buying Price per unit is the cost of each individual item.



For example, you bought these three candy bars for 89 cents each.

You can use the total cost to determine how much you payed for the three candy bars.

Number of units = 3. Price per unit = \$ 0.89

Steps to solve the problem: Step1: Write the formula. $total cost = (number of units) \times (price per unit)$

Step 2: Substitute data from problem

total cost = $3 \times .89$

Step 3 and solution: multiply 3 times .89 *total cost* = \$2.67 Example 2: Paul bought 6 calculators for his GED class for \$66. How much did he pay for each calculator? Step 1: Write the Total cost formula. total cost = (number of units) x (price per unit)Step 2: Substitute information in the problem into the formula. $66=6\times(price per unit)$ Notice in this case the unknown amount is (price per unit. Step 3: Using rules of algebra divide each side by 6. $\frac{66}{6} = \frac{6}{6} \times (price \ per \ unit)$ Notice that $\frac{66}{6} = 11$ and $\frac{6}{6} = 1$ $11 = 1 \times (price per unit)$ Notice that you can omit the 1. 11 = (price per unit)Solution: The price for each calculator is therefore \$11